

Amendment to the Abstract

Introducing blocks of foreign genes in a single operon would avoid complications such as position effect and gene silencing inherent in putting one gene at a time into random locations in the nuclear genome. Cloning several genes into a single T DNA does not avoid the compounded variable expression problem encountered in nuclear transgenic plants. This disclosure shows that a bacterial operon can be expressed in a single integration event as opposed to multiple events requiring several years to accomplish. Expression of multiple genes via a single transformation event opens the possibility of expressing foreign pathways or pharmaceutical proteins involving multiple genes. Expressing the Cry2aA2 operon, including a putative chaperonin to aid in protein folding, in the chloroplast via a single transformation event leads to production of crystalized insecticidal proteins. Expressing the Mer operon via a single transformation event leads to a phytoremediation system. A chloroplast transformation and expression vector which is capable of introducing multiple genes into a selected plant species by a single integration event, wherein each step gene of the multiple genes operon is carried out by an enzyme encoding a heterologous DNA sequence which includes an in the expression cassette codes for a heterologous protein, including as operably linked components, in the 5' to the 3' direction of translation, a promoter operative in the plastids which drives a multi-gene operon, a selectable marker sequence, the multi-gene operon which is functional to co-express multiple proteins in the plastids, a transcription termination region functional in the plastids, and flanking each side of the expression cassette, flanking DNA sequences which are homologous to DNA sequences inclusive of a spacer sequence of the target plastid genome, whereby stable integration of the heterologous coding sequence into the chloroplast genome of the target plant is facilitated throughout homologous recombination of the flanking sequence with the homologous sequences in the target plastid gene.